

Note on the First Satellite of Jupiter. By E. E. Barnard, M.A.

In reference to my previous remarks on the apparent duplicity of this satellite, I would state that it now transits in front of the dark south equatorial belt, and therefore does not appear dark in transit, being very nearly the same depth of shade as the belt when in mid-transit. Before these dark transits can again be observed the satellite's apparent latitude must increase considerably to shift it on to the bright surface of the planet south of the equatorial belt. This will not occur before the opposition of 1892.

I have been carefully watching the satellite, however, with the 12-in. when in transit as a bright spot, before it reaches the point of disappearance.

On August 3 I examined it thus, with the 36-inch refractor, when it appeared as an elongated white spot, the preceding end of which was the smaller. Under the best definition, with 700 diameters, this elongation was decidedly noticeable, and in moments of extra definition I suspected a line of separation; but this I could not be sure of. If the satellite actually consisted of two bodies the distance between their centres could scarcely have exceeded $0''.2$.

The angle of position was estimated to be $265^\circ \pm$ referred to the following end.

"At $13^h 0^m$ (Mt. H. M.T.) Satellite I. is surely much elongated—nearly parallel to the belts. Its shadow is large and round."

" $13^h 17^m$. There is no hesitation as to I. being elongated. Occasionally I think there are two; if so, the smaller one is preceding."

Shortly after this the satellite was lost or only faintly visible. Expecting to be able to catch it when leaving the disc, I turned to the east and observed Encke's Comet. Before the dome could be again turned to the south the satellite had just emerged. The definition then was not such as to give any information as to the form of the disc.

Satellite II. was carefully watched as it transited, preceding I. It appeared perfectly round until it wholly disappeared on the belt. *This was during the time that I. appeared elongated.*

Mount Hamilton:
1891 August 4.

On the Phenomena of the Transits of the First Satellite of Jupiter.
By E. E. Barnard.

The elongation of the disc of the first satellite at its transit on August 3, this year, recalls the first theory which I have previously offered in explanation of the apparent duplicity of that satellite at its transit on September 8, 1890.

On August 3 the angle of elongation was about 90° different from that of September 8, and the satellite appeared white in front of a dark belt.

The phenomena of both transits might now be quite satisfactorily explained by the assumption of a white belt on the satellite nearly parallel to the belts of *Jupiter*. To illustrate my idea I have prepared the drawing (Plate 14, fig. 5), which shows the appearance of the satellite on the two dates mentioned, side by side with the possible explanation. The left-hand figure of the upper drawing shows the satellite in double transit on the bright equatorial belt of *Jupiter*, September 8, 1890. The left-hand figure in the lower drawing shows the same object passing before the dark equatorial belt as an elongated white spot, on August 3, 1891.

In the first case, if a bright belt existed on the satellite, it would have the effect of apparently cutting it into two parts, since the belt would be lost in the bright surface of *Jupiter*. The satellite would, therefore, appear as two dusky dots, which, through irradiation, would appear small and round. The upper drawing explains this. In the second case—August 3—the satellite being seen on a dark ground, its dark surface would be lost, and only the bright belt would be seen, the result being just the reverse of the first case. The lower drawing explains this. In other words, if there is a bright belt on I., that satellite will appear double when its transit occurs over a bright part of *Jupiter*, since the dark portions of its surface alone will be visible. When it transits before a dark belt it will appear elongated, the bright belt of the satellite alone being seen.

If the drawing is examined at a distance of six or eight feet, it will clearly illustrate these statements.

Whether the above is the true explanation of the observed phenomena or not must be decided by future observations. The only other alternative is that the satellite is double. In either case the observations certainly establish an important fact. Either the satellite has a bright belt on it similar and nearly parallel to those of *Jupiter*, and, reasoning from analogy, it rotates on an axis nearly perpendicular to the plane of its orbit, or it is actually double.

The true theory can be settled with absolute certainty by careful observations. If the phenomena are caused by a white belt, the satellite, when it transits a bright portion of *Jupiter*,